SMALL MAMMAL STUDIES ON A SOUTHEAST ALASKA CUTOVER AREA

R. C. McGREGOR

STATION PAPER NO. 8 JANUARY 1958

ALASKA FOREST RESEARCH CENTER
U. S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE
JUNEAU, ALASKA
R. F. TAYLOR, FORESTER IN CHARGE

SMALL MAMMAL STUDIES ON A SOUTHEAST ALASKA CUTOVER AREA

R. C. McGregor, Forester

INTRODUCTION

Small mammals can affect forest regeneration adversely because tree seeds and seedlings constitute an important food source. In other regions, small mammals have retarded regeneration and even accounted for failures that occurred under otherwise favorable conditions. A method of excluding, repelling, or eliminating seed-eating mammals is considered essential for adequate seed germination and seedling survival wherever direct seeding has been undertaken.

Satisfactory natural reproduction is difficult to obtain on certain Southeast Alaska sites. On deep, well-drained soils in valley bottoms, for example, brush species such as salmonberry and currant may dominate the site following logging, particularly after a succession of poor seed years. The stocking of coniferous reproduction may be entirely inadequate, and expensive treatments are required to return this land to full timber production.[1/] Prompt regeneration at an adequate density is essential on these productive sites. Direct seeding may be a practical method of obtaining it.

In view of these facts, studies of small mammal populations were started on the Maybeso Experimental Forest[2/] in 1954[3/] and expanded in 1956 to obtain additional information on their distribution, abundance, and methods of control. Logging started on the Experimental Forest in 1953, and 1,700 acres have now been clear-cut and yarded.

1/ Andersen, H. E. The problem of brush control on cutover areas in Southeast Alaska. Tech. Note No. 33, Alaska Forest Research Center, 2 pp., 1956.

2/ Located on Twelve Mile Arm of Kasaan Bay, Prince of Wales Island, Alaska.

3/ James, G. A. The rodent problem on cutover areas in Southeast Alaska. Tech. Note No. 31, Alaska Forest Research Center, 2 pp., 1956.

SMALL MAMMAL DISTRIBUTION

The general pattern of small mammal distribution was established from studies of both published and unpublished sources. In addition, specimens have been collected from various localities and study skins prepared. The list below shows the small mammals known to occur and an estimate of their range in Southeast Alaska. Their wide distribution indicates that studies on the Maybeso Experimental Forest may have application to cutting areas throughout Southeast Alaska.

Name		Southeast Alaska Range
Shrews		
Sorex cinereus	Cinereus shrew	Throughout, except Prince of Wales Is.
S. obscurus	Dusky shrew	Throughout
S. palustris	Water shrew	Mainland only
Squirrels		
Tamiascuirus hudsonicus	Red squirrel	Mainland plus Admiralty, Kupreanof, Mitkof, and Wrangell Is.
Glaucomys sabrinus	Flying squirrel	Mainland plus Mitkof, Wrangell, Etolin, Prince of Wales, and Revillagigedo Is.
White-footed mice		
Peromyscus maniculatus	White-footed mouse	Throughout, except Baranof and Chichagof Is.
P. sitkensis	Sitka white-footed mouse	Baranof and Chichagof Is.
Lemming		
Synaptomys borealis	Lemming mouse	Mainland only
Red-backed voles		
Clethrionomys gapperi	Boreal red-backed vole	Mainland from Taku River north and west
C. rutilus	Tundra red-backed vole	Mainland from Thomas Bay south and east; Wrangell and Revillagigedo Is.
Meadow voles		
Microtus pennsylvanicus	Meadow vole	Admiralty Is. and valleys of Taku and Stikine Rivers

Name		Southeast Alaska Range
M. oeconomus	Tundra vole	Baranof and Chichagof Is. and gulf coast from Cape Spencer north to Yakutat Bay
M. longicaudus	Long-tailed vole	Mainland from Glacier Bay to Portland Canal and all islands south of Frederick Sound
M. coronarius	Coronation Is. meadow vole	Coronation and Forrester Is.
Jumping mouse		
Zapus hudsonius	Meadow jumping mouse	Yakutat, Haines, and mouth of Taku River

SMALL MAMMAL ABUNDANCE

Methods

The study area was in a clear cutting logged by high lead yarding. Fig. 1 illustrates the habitat conditions.

Figure 1.--Small mammal habitat, clear-cut area, Maybeso Experimental Forest.

Small mammal populations were estimated on ten 5-acre plots spaced along a three-mile section of Maybeso Creek valley; five plots along the valley bottom and five on a south-facing slope. Ten permanent trap locations, selected in desirable mouse habitats and spaced one chain apart in two parallel rows three chains apart, were established on each plot. A Sherman live trap (fig. 2) was baited with rolled oats and peanut butter at each trap location and set for two successive nights.

Censuses were made in these trapping areas during the four periods July 2-6, July 31-August 4, August 27-31, October 23-25, 1956.

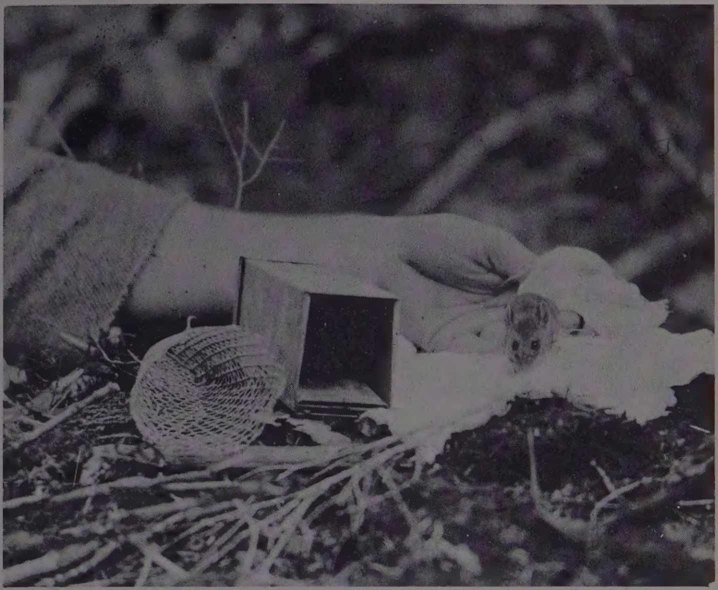
Captured animals were released after determination of species, sex, and age (adult, sub-adult, or juvenile) and marking by toe clipping. Customary procedure was to shake the animal out of the live trap into a cone-shaped piece of hardware cloth and then block the exit with a cloth (fig. 3). By this means the animal was held stationary and its feed could be pulled through the mesh for toe clipping.[4/]

Two nights of trapping could not be relied upon to capture all of the animals on a single plot. Therefore, one of the plots was chosen to be trapped for six consecutive nights. In this period all resident animals were presumed captured, an assumption based upon the rate of decrease of unmarked animals caught. The ratio of two-night capture to total resident population thus determined was applied to the results from the other nine plots.

Figure 2.--A typical live trap installation.

4/ Method suggested by Dr. Albert C. Hawbecker, Fresno State College, Fresno, California.

Figure 3.--Capture cone, live trap, and white-footed mouse.



Results

During 850 trap-nights, 147 separate small mammals were captured as listed in table 1. Species identification is tentative pending verification of specimens sent to the U. S. National Museum.[5]

Of 124 white-footed mice marked and released 32 were recaptured--23 of them once, 7 of them twice, 1 three times, and 1 four times--for a total of 44 recaptures. Seventy-five percent of all white-footed mice recaptures occurred within two chains of the initial capture point, indicating a normal radius of activity of less than two chains (table 2). The fact that half of these recaptures occurred over more than one census indicates that the 11 mice recaptured at distances in excess of two chains probably represent adjustments in ranges and wandering individuals.

Twenty-three percent of the white-footed mice caught in the live traps were found dead. Many were sick and died soon after release. Most of the mortality occurred during the October census when minimum temperatures reached 29° to 33° F. All of the shrews captured died in the traps. Steel traps apparently are unsuitable for population studies when minimum temperatures fall below 40° F. Cold and hunger seem to be the principal mortality factors. Fright may be an additional cause of death for shrews.

5/ Acknowledgment is made to Dr. John Buckley, Cooperative Wildlife Unit, University of Alaska, who supplied the live traps and arranged for identification of specimens.

Table 1.--Small mammals captured during 850 trap nights

Species	Animals marked
	Number
Peromyscus maniculatus hylaeus (Osgood)	
White-footed mouse	124
Sorex obscurus longicauda (Merriam)	
Dusky shrew	14
Microtus longicaudus littoralis (Swarth)	
Long-tailed meadow mouse	8
Glaucomys sabrinus zapheus (Osgood)	
Flying squirrel	1
Total	147

Table 2.--Distance of recaptures from point of initial capture (white-footed mice)

Distance (chains)	Individual recaptures	
	Number	Cumulative percent
1/0.0	19	43
1.0	10	66
2.0	4	75
3.0	2	80
3.3	4	89
3.5	3	95
4.3	2	100
Total	44	

1/ Same trap as initial capture.

During the 850 trap nights there were 146 robberies in which the animals ate part or all of the bait, reflecting the trappers' inability to set the triggers sensitively enough to catch the animal. Because of the wide spacing of traps and the limited range of individual activity, each robbery was represented as an additional animal in the analysis of trap records.

The number of young, small mammals increased noticeably between the third census (late August) and the fourth census (late October), supporting observations in other regions that autumn is a time of population increase.

Mean population levels, in terms of mice per acre, for valley bottom and slope habitats are shown in table 3. Animal density on individual plots was as high as six per acre. The greatest density of white-footed mice was in the valley bottom. This is also the area where brush invasion is a silvicultural problem.

Shrew populations were difficult to measure because the animals were not easily attracted to traps. Trapping records indicate that they were concentrated in the most recently logged areas and that they found the sidehill habitat more desirable than the valley bottom. This may be the result of less competition with white-footed mice on the sidehill areas.

Table 3.--Populations of white-footed mice on clear-cut areas on the Maybeso Experimental Forest, 1956

Date	Animals per acre	
	Valley bottom	Slope
	Number	Number
July 4	2.8	2.0
August 2	4.0	1.2
August 29	4.0	1.6
October 24	3.8	2.2

Meadow voles were limited to areas of succulent vegetation. They were absent, however, from several grassland habitats, perhaps due to the cyclic nature of vole populations. Snap-trap studies in 1954 and 1955 failed to indicate the presence of voles in the clear-cut area. The following year, 1956, may have been a year of relative abundance for this species.

The significance of present population levels in terms of damage to seed and seedlings is unknown. Additional studies are needed to determine the amount of damage associated with particular species and numbers of small mammals.

CONTROL OF RODENTS

Methods

Two small mammal study plots with the highest populations were poisoned to determine the effectiveness of poison baits. A 10-chain-wide buffer strip around each plot was also treated, resulting in two 75-acre poisoned areas. Wheat grains dyed green and soaked in sodium fluoroacetate (Formula 1080)[6/] were broadcast on July 17, 18, and 19 at the rate of one-half pound per acre over the two 75-acre blocks. The effectiveness of the poisoned grain was determined by continued trapping of the plots.

Results

The reduction in population density resulting from poisoning is shown in table 4. The population on the valley bottom plot was reduced markedly by August 2, two weeks after poisoning. By October 24, 14 weeks after poisoning, the population on the poisoned plot had returned to almost 90 percent of the original while the unpoisoned plot showed a slight increase during the same period.

Poisoning apparently eliminated white-footed mice from the sidehill habitat in the first two weeks after treatment. Re-invasion from surrounding unpoisoned areas was slow, probably because of low population densities throughout the sidehill habitat. Fourteen weeks following poisoning, the population of the poisoned plots was less than 40 percent of the original level.

The poisoned-bait studies indicated that:

> Populations of from one to three white-footed mice per acre were entirely eliminated.
>
> Re-establishment of original population levels on valley bottom areas was almost complete 14 weeks after poisoning.
>
> Less than one-half of the original population level was present 14 weeks after poisoning the sidehill habitats.

6/ Furnished by Maurice W. Kelly, Predator and Rodent Control Supervisor, U. S. Fish and Wildlife Service, Juneau, Alaska. Mr. Kelly also participated in the baiting operation.

Placing bait in favorable locations such as under logs and in stump hollows was more effective than broadcasting.

Table 4.--White-footed mouse populations per acre on poisoned and unpoisoned plots in a clear-cut area, Maybeso Experimental Forest, 1956

Date	In valley bottom		On sidehill	
	Poisoned	Unpoisoned	Poisoned	Unpoisoned
	Number	Number	Number	Number
July 4	1/ 3.5	2.7	1/ 2.1	1.9
August 2	0.5	3.9	0.0	1.3
August 29	0.5	3.5	.0.7	1.5
October 24	3.1	3.7	0.8	2.2

1/ Before poisoning. Poisoned on July 17, 18, and 19.

These studies verified the typical experience in other regions: the usefulness of poisoned baits is limited because the population vacuum created is quickly re-occupied by white-footed mice from surrounding areas. The well-established principle of applying poison to the seed itself should be tested under Southeast Alaska conditions.

SUMMARY

Small mammal populations have been the principal deterrent to successful direct seeding of cutover areas in other regions. Studies were made in a large clear-cut and high-lead yarded area on the Maybeso Experimental Forest in Southeast Alaska to determine the abundance of such small mammals and methods of control.

Populations of Peromyscus, the white-footed mouse, average 1.2 to 4.0 per acre on the clear-cut area. Concentrations as high as six per acre were found in favorable habitats and were higher in the valley bottom sites than in sidehill habitats. Shrews (Sorex) were more numerous on sidehills than elsewhere. The meadow vole (Microtus) was also found, but mainly in grassy areas.

Re-occupation of bait-poisoned areas occurred rather quickly and indicated the inadequacy of this method for protecting seeds and seedlings from destruction by small mammals.

GPO 990480